Solving

$$y = \pm a(x-h)^2 + k$$

① $x^2 + 4 = 20$

$-4 \quad -4$

$\sqrt{x^2} = \sqrt{16}$

$x = 4, -4$

② $x^2 - 3 = 22$

$+3 \quad +3$

$\sqrt{x^2} = \sqrt{25}$

$x = +5, -5$

③ $\sqrt{(x-4)^2} = 36$

$x - 4 = \sqrt{36}$

$x - 4 = 6, -6$

$+4 \quad +4 \quad +4$

$x = 10, -2$

$x^2 = 16$

$(4)^2 = 16$

$(-4)^2 = 16$

④ $\sqrt{(x+5)^2} = \sqrt{100}$

$x + 5 = +10, -10$

$-5 \quad -5 \quad -5$

$x = 5, -15$

⑤ $\frac{2}{2}x^2 = \frac{8}{2}$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

⑥ $-2(x-2)^2 + 4 = -28$

$-4 \quad -4$

$\frac{-2}{-2}(x-2)^2 = \frac{-32}{-2}$

$\sqrt{(x-2)^2} = \sqrt{16}$

$x - 2 = +4, -4$

$+2 \quad +2 \quad +2$

$x = 6, -2$

Quadratic Forms:

		for example
Vertex Form: graphing form	$y = \pm A(x - H)^2 + K$	e.g. $y = 2(x - 2)^2 - 2$
Factored Form:	$y = \pm A(x - R_1)(x - R_2)$ (R_1, R_2: roots, x-ints)	e.g. $y = 2(x - 1)(x - 3)$
Polynomial Form: used for data fitting	$y = \pm ax^2 + bx + c$	e.g. $y = 2x^2 - 8x + 6$

Equation is called a quadratic

Graph is called a parabola

Polynomial form

$y = ax^2 + bx + c$ → constant

- ax^2 → quadratic term
- bx → linear term

$y = 5 - 3x + x^2$

- 5 → constant

Fit a quadratic model, i.e. an equation, to a set of data

x	y
2	3
3	13
4	29

$y = ax^2 + bx + c$

$3 = a(2)^2 + b(2) + c \longrightarrow 4a + 2b + c = 3$

$13 = a(3)^2 + b(3) + c \longrightarrow 9a + 3b + c = 13$

$29 = a(4)^2 + b(4) + c \longrightarrow 16a + 4b + c = 29$

Solve for a, b, c

$$\begin{bmatrix} 4 & 2 & 1 \\ 9 & 3 & 1 \\ 16 & 4 & 1 \end{bmatrix} \cdot \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 3 \\ 13 \\ 29 \end{bmatrix}$$

(A) B

$A^{-1} \cdot B = X$

$a = 3$

$b = -5$

$c = 1$

$y = 3x^2 - 5x + 1$

Find the equation for the data

$(1,-2)\ (2,-2)\ (3,-4)$

$y = ax^2 + bx + c$

x	y
1	-2
2	-2
3	-4

$-2 = a(1)^2 + b(1) + c \rightarrow 1a + 1b + c = -2$

$-2 = a(2)^2 + b(2) + c \quad 4a + 2b + c = -2$

$-4 = a(3)^2 + b(3) + c \quad 9a + 3b + c = -4$

$$\begin{bmatrix} 1 & 1 & 1 \\ 4 & 2 & 1 \\ 9 & 3 & 1 \end{bmatrix} \cdot \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} -2 \\ -2 \\ -4 \end{bmatrix}$$

$[A] \cdot [X] = [B]$

$\Rightarrow a = -1,\ b = 3,\ c = -4$

$y = -x^2 + 3x - 4$

$y = 3x^2 - 5x - 1$

Find vertex

$x = \frac{-b}{2a}$

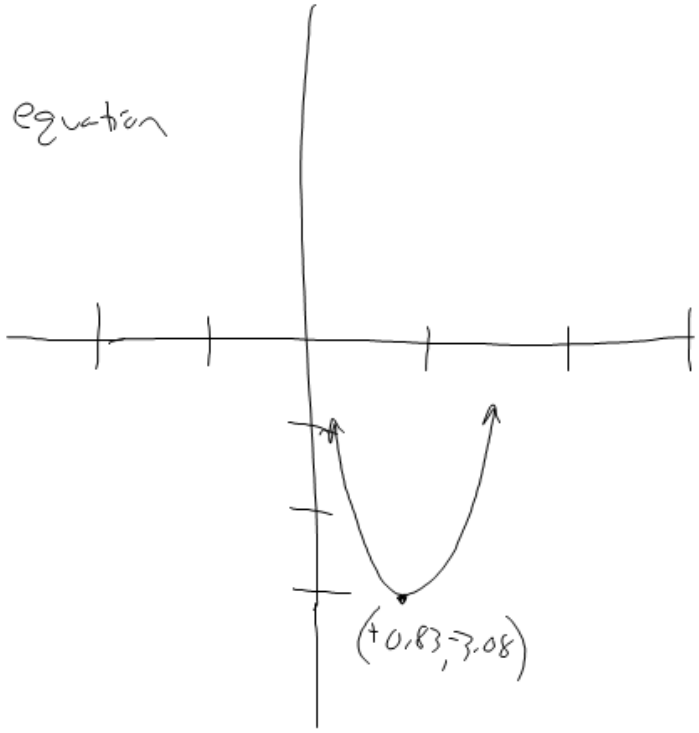
$x = \frac{-(-5)}{2(3)} = \frac{5}{6}$ x-coord. of vertex

To get y-coord., plug x into equation

$y = 3x^2 - 5x - 1$

$y = 3\left(\frac{5}{6}\right)^2 - 5\left(\frac{5}{6}\right) - 1$

$y = -3.08$ y-coord of vertex



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#10-15 (ignore directions — write equation)

#18-20

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